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ABSTRACT
        This paper examines the relationship that exists
between the syntactic and phonological components of the
transformational-generative model insofar as their formal structures
are concerned. It is demonstrated that the number and importance of
the structural similarities between the syntax and the phonology make
it necessary to provide for them in the theory. The author suggests
this be done by showing that underlying the two components of the
grammar there is a single unified structure, with a generative
capacity embodied in a set of string-structure rules and a further
set of transformational rules converting a deep level of
representation to a surface representation and embodying such
phenomena as neutralization, ordering, cycling, and other properties.
(RL)

42

On the Formal Componential Structure of the

Transformational-Generative Model of Grammar

P.J. Brew

Most formal models of language make use of some
notion of different components or levels into which they
see the language as divided. I propose to examine the
relationship that exists between the syntactic and
phonological components of the transformational-generative
model, in so far as their formal structures are concerned.
That is, not what is normally meant by their 'interrelation'
(for example, whether one is interpretive of the other),
but rather simply to compare the formal structure of the
one with that of the other.

An example of a model in which this relationship is
quite clear - at least in its basic conception - is that
of stratificational grammar - and here the relationship
is of course that of identity. There is one pattern of
formal structure which is exactly repeated at each of the
several strata.

1

Transformational grammarians have criticised
stratificational grammar for setting up what they
consider to be such a rigid a priori theoretical
framework. Transformational grammar itself has adopted
a far more flexible approach to model building, allowing
each component to build up whatever structure it has
found necessary in investigating the data, with a minimum
of a priori constraints. This has meant that, in practice
at least, the two components in question - (1 am excluding
the semantic component only because so little is known
about it) - have evolved largely independently of each
other as far as their formal structure is concerned. In
practice, and, it would seem, in theory too, the formal
descriptions of the theoretical framwork which are quite
frequently given are almost invariably set in terms of
one component or the other, or sometimes of one component
and then the other. Even Chomsky's 1961 paper which
bears the promising title 'On the Notion "Rule of Grammar"'
turns out to be, in fact, on the notion "rule of syntax".
For the phonology we are referred to Halle (1959).

The one exception to this is Chomsky"s early (pre-
Syntactic Structures) unpublished paper 'The Logical
Structure of Linguistic Theory', in which he does sketch
out a uniform framework' common to all levels of
representation. But since then, as far as I know, the
idea has not been mentioned again, though there is a
brief reference to it in a footnote in Aspects of the
Theory of Syntax. I take this to indicate that the notion
of a uniform structure underlying the different levels or
components has been dropped.

But, it may be objected, far from being dropped, the
notion has in fact been developed into one of the most
important parts of the theory - it is precisely this that
the whole theory of (formal) linguistic universals is about.
In answer to this I would quote from the section of
Aspects (p.28) in which the theory of (formal) universals
is expounded:

'Particular assumptions about linguistic
universals may pertain to either the syntactic,
semantic, or phonological component, or to
interrelations among the three components.'

In other words, formal universals are similarities between
different languages in one or other of the components.
There is no mention here, or elsewhere in the exposition
of similarities between components. Thus, Chomsky quotes
distinctive features as an example of a (substantive)

44

universal 'with respect to the phonological component'
and that the 'syntactic component of a grammar must
contain transformational rules ...', as another example.

Of course there is little point in discussing whether
the notion of a single underlying componential structure
has or has not been 'officially' dropped. It is, I think,
a fact that it has virtually not been mentioned since
1955, and what I am suggesting is that it should be re-
examined. The rest of this paper will be devoted to
presenting the evidence which leads me to make this
suggestion.

When I said earlier that in practice the two
components have built up their formal structure largely
independently of each other, I was not of course implying
that they were therefore totally different. Indeed
certain similarities have long been noted: for example,
the levels of deep and surface structure of the syntax
parallel the systematic phonemic and systematic phonetic
levels of the phonology; the phonological rules are
technically transformational rules which map the 'deep'
level of representation onto the surface level; the
cyclical application of rules is another example.

But, it seems to me, while these similarities have
been noted with interest, no theoretical significance is
attached to them, and no explanation is offered for them.
To that extent I think it is fair to say that they are
treated more or less as coincidences.

I think perhaps there has been one big stumbling-
block in the path towards providing the explanation of a
single uniform componential structure which I am advocating.
This is the essential asymmetry built into the theory by
virtue of the fact that the generative capacity of the
grammar resides uniquely in the syntax. This, more than
anything else is what constitutes the difference in
structure between the generative models and most others.
The point is made repeatedly in the literature. Thus
Chomsky and Halle (1968), p.6:

> 'The part of the grammar which has this
> recursive property is the syntactic component.'

and Postal (1968), p.205:

> 'The productive (recursive) power of the grammar
> resides entirely [my emphasis] in the Syntactic
> Component.'

3

and:

> '... the Semantic and Phonological Components
> play a <u>purely</u> [my emphasis] interpretive role.'

One possible way out of this difficulty would be to
claim that <u>excluding</u> the phrase-structure component there
are sufficient similarities of structure between the
syntactic and phonological componets to justify the placing
of the phrase structure rules outside of the syntactic
component - in fact to set it up as a unique and separate
component on its own. This does not seem wholly convincing,
however, since the phrase-structure rules clearly are
specifically <u>syntactic</u> in nature and seem to belong
naturally within the syntactic component.

Fortunately we do not have to fall back on this
solution, since there is another to hand. It is simply to
show that the statements quoted above are in fact wrong -
that the phonological component at least does not play an
<u>entirely</u> interpretive role; that it too in fact has a
generative capacity. To put it another way, that the term
'generative phonology' is meaningful in its own right, and
not simply as short-hand for 'the phonology of generative
grammar'.

That Postal's second statement is untrue becomes clear
as soon as one considers the long-established secondary
role of the phonological component - that of defining the
notion 'possible (as opposed to attested) morpheme'. This
notion is sharpened by Stanley (1967), who also provides
the machinery by which the necessary constraints can be
stated, but this function of the phonological component is
not new. In fact the notion 'possible morpheme' pre-dates
generative grammar. Since the notion is so old, and since
this function is clearly in no sense interpretive, it is
surprising to find Postal making such a statement.

But if this disproves Postal's second statement, does
it necessarily disprove the first? In other words, is it
true that the phonology has any generative capacity? I
believe it does.

The generative capacity of the grammar consists
essentially in the setting up of an inventory of elements
together with the convention that they can be concatenated
to form strings at the 'deep' level of representation. The
role of the phrase-structure rules is then to place heavy
constraints on this operation, and thereby to distinguish
between well-formed and ill-formed strings. In the syntax,
the definition of what constitutes a well-formed 'deep'

string is not in fact entirely left to the PS rules.
Further restriction are placed on concatenation by the
so-called 'filtering' effect of the transformational
rules, and also by the selectional restrictions, which
prevent lexical items with certain syntactic features from
co-occurring with other, incompatible features. I believe
it to be the case that virtually all I have described
takes place in the phonological component as well as the
syntactic, and that it is therefore necessary to recognise
a generative capacity in that component too.

Stanley in 1967, writing on Redundancy Rules in
Phonology, clearly saw that the phonological component
performed two quite distinct functions and he wished to
emphasise this by gathering the morpheme structure rules
together - (they were previously scattered throughout the
phonological transformational rules) and also by changing
the name from 'rules' to 'conditions'. He failed, however,
to see the correspondence between these two functions of
the phonological component and those of the syntactic
component. In view of the correspondence that I wish
to establish between the morpheme structure conditions
and phrase-structure rules, I would prefer, in order to
emphasise this correspondence, to revert to the term
'rule'.

I believe the reason Stanley failed to see a
correspondence between morpheme and phrase-structure rules
is that, as Fudge has pointed out, he failed to develop
his rules to include the crucial element of recursion. As
is shown by the above quotation Chomsky and Halle virtually
equate the generative capacity with the power of recursion.
But Stanley specifically excludes it from the phonology by
asserting that the set of possible morphemes of a language
is finite, and this is because there is a finite maximum
length to the morpheme. There is, is seems to me, absolutely
no justification for this claim.

The underlying cause for this confusion is, I believe,
the failure on Stanley's part to distinguish between
syllable and morpheme. The syllable at present enjoys only
semi-official status in the literature of generative
phonology, but I think it is becoming increasingly clear
that it must be brought fully into the theory. There are
two reasons why I believe Stanley to be thinking 'syllable'
when he says 'morpheme'. The first is that in illustrating
his proposed 'positive morpheme structure conditions' he
asks us to 'suppose that all the morphemes in some language
are of the form:

$$C \ (L) \ V \ (\{_L^C\})$$

Now, it is true that the definition of the syllable
presents great difficulties, but surely one characteristic
is clear - that there will be only one vocalic nucleus
per syllable. It is clear then that the language Stanley
is asking us to imagine contains exclusively monosyllabic
morphemes. This surely cannot be intentional. While the
illustrative structure would serve very well as a
syllable-structure rule for some language, there are
surely few if any natural languages for which it could be
a morpheme-structure rule.

The second reason for believing that Stanley is
thinking of syllables rather than morphemes is that all
the other morpheme-structure rules he mentions would in
fact seem to apply to syllables. Take for example the
rule of English that the segment which follows a morpheme-
initial nasal must be [-consonantal]. Thus a morpheme
such as [nup] is permissible while *[ntup] is not. But
it is also true that while a morpheme such as [hakniy] is
permissible, *[hakntiy] is not. Note that this latter is
not covered by the rule mentioned because the nasal is
not in morpheme-initial position. Therefore a separate
and quite complicated rule would be needed to handle this
example. It is I think fairly clear though that in fact
it is the same constraint which applies in both cases and
that the environment has been wrongly specified. If the
rule is seen as a syllable-structure rule and the environ-
ment specified as syllable-initial position, then the
same rule naturally covers both cases.

If Stanley then, has shown us what syllable-structure
rules would be like, it remains to see what a true
morpheme-structure rule would be like. This is where the
phenomenon of recursion which appeared to be exclusively
a property of the phrase-structure rules, comes into the
picture. For the difference between a syllable and a
morpheme is precisely one of maximum length. While a
syllable is finite (and in fact quite short) in length,
a morpheme is not. It consists of any number of syllables,
usually with no constraints on the types of syllables which
may be conjoined. (Vowel harmony constitutes an obvious
exception to this, and I shall return to it shortly.) In
other words, morpheme-structure rules consist of syllable-
structure rules plus the phenomenon of iteration, which is
of course a type of recursion. Thus this difference
between the phrase- and morpheme-structure rules is
reduced considerably. It is not that one involves recursion
and the other does not, but simply that while phonology has
only iterative recursion, the syntax has embedding as well[1].

In considering the question of whether or not the
phonology can be considered to have a generative capacity,
one must be careful not to allow considerations of the
use to which this generative power is put to enter into
the question of whether it exists. There is of course an
enormous difference of scale between the ways we use the
the two types of generative power, and I believe it may
be this difference which has obscured the fact that in
their formal structure they are very similar. We use our
syntactic generative power every time to speak; we use
our phonological generative power only on the rare
occasions that we invent new morphemes and on the perhaps
less rare occasions when we 'nativize' the pronunciation
of a foreign loan-word.

The question of vowel harmony brings me back to the
way in which the constraints that apply to the possible
concatenation of elements into strings are formulated.
At present in the syntax these constraints are expressed
in three forms - the PS rules, the selectional constraints
and the so-called filtering effect of transformational
rules. The correspondences I see are these. Stanley's
positive MSR's correspond to the PS rules. The first rule
would obviously be:

morpheme → syllable*

The second, for English, would be:

syllable → ($\genfrac{}{}{0pt}{}{\text{initial}}{\text{C-cluster}}$) vocalic ($\genfrac{}{}{0pt}{}{\text{final}}{\text{C-cluster}}$)
nucleus

The consonantal clusters would rewrite in terms of stops,
liquids, nasals, etc., while the vocalic nucleus would
rewrite in terms of simple vowels, dipthongs, and possibly
glides.

To the selectional constraints would correspond the
rest of the redundancy rules, which are written in terms of
the compatibility of various phonological features of
segments combined in the same morpheme.

There is a further correspondence which I have not so
far mentioned, Stanley's segment-structure rules correspond
to the redundancy rules of the lexicon - just as no segment
of English can be both [+nasal] and [-voice] so no lexical
item can be both [+human] and [-animate].

There is also a correspondence in the third case -
that of the filtering effect of .T-rules, but this needs
some clarification.

Filtering is a necessary second line of constraint after the PS rules because the PS rules themselves, although they allow for recursion, do not provide for any constraint on which simplex string may recursively combine with which other simplex string to form a complex string. Therefore, where such constraints exist - and only in such cases - filtering is necessary. I have shown that recursion is a property of the morpheme-structure rules, so any constraints in its operation would have to be dealt with in the same way. Normally of course, there are, I think, no constraints on which syllables may combine to form complex morphemes - but vowel harmony is the exception. It would therefore be natural to handle it in a similar way to the way the same constraint is handled in the syntax, namely by a special convention 'that a well-formed surface structure cannot contain internal occurrences of the boundary symbol' (Chomsky 1965, p.138), together with the necessary conditions on the transformational rules involved.

In conclusion, then, I believe that I have shown that the number and importance of the structural similarities between the syntax and the phonology make it necessary to provide for them in the theory. I propose that this should be done by showing that underlying the two components of the grammar there is a single unified structure, with a generative capacity embodied in a set of string-structure rules and a further set of transformational rules converting a 'deep' level of representation to a surface representation and embodying such phenomena as neutralisation, ordering, cycling, and many other properties. As a natural extension of this thesis I would suggest that where it is found necessary, on independent grounds, to develop some structure for one component which does not occur in the other, then the evaluation measure should assign some notional 'cost' to this exceptional feature, thereby providing an incentive either to find an alternative way of handling the problem involved, or of showing that there is in fact a need for the new type of structure in the other component also.

[1]Note: The claim that the morpheme-structure rules, like the PS rules, must allow for infinite recursion is of course not crucial to the argument that the phonology is generative. The generative power of the phonology is adequately established if recognition is given to the native speaker's ability to invent new morphemes, and in doing so, to distinguish between well-formed and ill-formed ones.

50

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